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# मानक

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IS 8263 (1976): Methods for radio interference test on high voltage insulators [ETD 6: Electrical Insulators and Accessories]



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Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”



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*Indian Standard*

**METHOD FOR RADIO INTERFERENCE  
TEST ON HIGH-VOLTAGE INSULATORS**

( First Reprint FEBRUARY 1983 )

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**INDIAN STANDARDS INSTITUTION**  
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**NEW DELHI 110002**

*Indian Standard***METHOD FOR RADIO INTERFERENCE  
TEST ON HIGH-VOLTAGE INSULATORS**

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*Indian Standard***METHOD FOR RADIO INTERFERENCE  
TEST ON HIGH-VOLTAGE INSULATORS****0. FOREWORD**

**0.1** This Indian Standard was adopted by the Indian Standards Institution on 26 November 1976, after the draft finalized by the Electrical Insulators and Accessories Sectional Committee had been approved by the Electrotechnical Division Council.

**0.2** This standard covers the test method for radio interference ( R I ) test on clean dry insulators at frequencies in the range of 0.5 MHz to 2 MHz. It is recognized that the radio interference characteristics of an insulator may be modified by ambient conditions in service, such as moisture, rain and pollution. However, radio interference tests simulating all of such conditions, besides being very complicated may be unnecessary. Exception may have to be made for pollution conditions, for which a special test may have to be developed.

**0.3** The frequency range 0.5 MHz to 2 MHz is considered sufficient, except for polluted surface conditions, which may generate interference at higher frequencies. Actually, except for polluted surface conditions, the interference from insulators considerably decreases when frequency increases above 2 MHz, unless some kinds of faults external to the insulator are present ( faulty contacts between metal parts especially when corroded, damaged arc devices, etc ).

**0.4** In the preparation of this standard, assistance has been derived from IEC Pub 437(1973) 'Radio interference test on high voltage insulators,' issued by the International Electrotechnical Commission.

**0.5** For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS: 2-1960\*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

**1. SCOPE**

**1.1** This standard covers the method for carrying out the radio interference test for bushings, post insulators, rigid insulators, string insulator units and string insulator sets.

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\*Rules for rounding off numerical values ( *revised* ).

NOTE — The performance of a complete string insulator set is not precisely calculable from the results of tests on the units, but an approximation may be made taking voltage distribution into account. This may enable tests on single units to be made as an alternative to more complicated tests on the complete string.

## 2. GENERAL

2.1 The radio interference characteristics of an insulator may be determined by measurements at a series of voltages, but to specify an insulator performance it is necessary to specify the maximum permitted radio interference level at a specified test voltage. The specified test voltage shall be related to the voltage to be applied to the insulator in normal service, that is, equal to the highest system voltage divided by  $\sqrt{3}$ . Since the service voltage is not a characteristic of an insulator, different radio interference test voltages may apply to the same insulator for different operating conditions.

2.2 The method of mounting the insulator and the presence of arcing horns, grading rings, etc, may considerably influence the results of radio interference tests, especially for the larger insulators.

2.3 The radio interference level to be permitted at the specified test voltage depends on many factors, such as the importance and vulnerability of the radio communications which are to be protected against interference and the distance of the receiver from the source of interference. For all these reasons, agreement between the manufacturer and the purchaser may be necessary to decide the following:

- a) The value of test voltage,
- b) Details of the arrangement of the insulator for test, and
- c) The level of radio interference to be accepted.

NOTE — The values of acceptable radio interference levels are under consideration for stipulation in the relevant equipment specification.

## 3. APPLICABILITY OF THE TEST

3.1 This test is an optional type test and shall be made only in special cases when agreed by the purchaser and the manufacturer. This agreement shall in particular specify the value of test voltage and the level of radio interference to be accepted ( *see* 2.3 ).

## 4. ARRANGEMENT OF INSULATORS FOR TEST

4.1 The details of the arrangement of the insulators for test and the accuracy with which service conditions need to be reproduced shall be



subject to agreement between the purchaser and the manufacturer, taking account of the following guidance:

- a) For rigid insulators and string insulator units, the standard method of mounting given in **B-2** of IS:731-1971\* is usually satisfactory.
- b) String insulator sets, post insulators or bushings with rated lightning impulse withstand voltages of 325 kV or less may usually be tested with the standard method of mounting given in **B-2** of IS:731-1971\*, **C-1** of IS:2544-1973† and **B-1** of IS:2099-1973‡ respectively.
- c) Insulators with rated lightning impulse withstand voltages greater than 325 kV should be mounted for test closely imitating service conditions. They should be complete with ancillary metal fittings, such as arcing horns or grading rings, hooks, links, yokes and conductor clamps. The earthed metal work on which the insulator shall be supported and the high-voltage conductor to be used in service may also be simulated.

## 5. TEST PROCEDURE

5.1 The test circuit shall be as shown in Fig. 1.

5.2 The measuring set shall comply with IS:6872-1972§. It shall preferably be tuned to a frequency within 10 percent of 0.5 MHz, but other frequencies in the range of 0.5 MHz to 2 MHz may be used, the measuring frequency being recorded.

5.3 The results shall be expressed as dB above 1 micro-volt [ $\text{dB } (\mu\text{V})$ ] across a resistance of 300 ohms and the effective resistance of the measuring set and any resistors associated with it ( $R_L$ ) should preferably be 300 ohms. If other resistance values are used, they shall be not more than 600 ohms nor less than 30 ohms, the equivalent radio interference voltage across 300 ohms may be calculated assuming the measured voltage to be directly proportional to the resistance, except for test pieces of large capacitance, such as bushings, for which a correction made on this basis may be inaccurate. Therefore a 300 ohms resistance is always recommended for bushings.

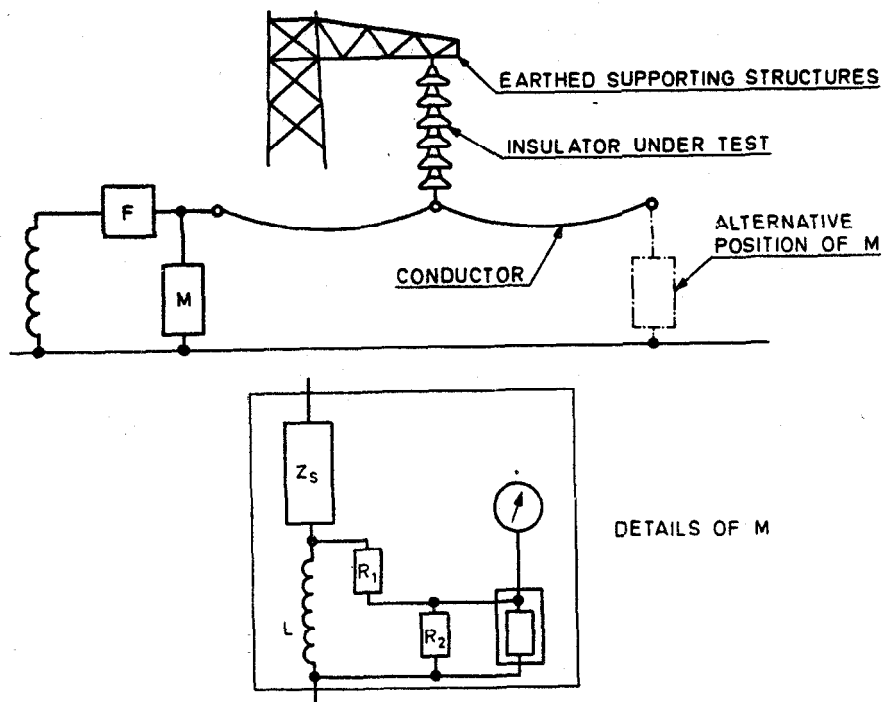
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\*Specification for porcelain insulators for overhead power lines with a nominal voltage greater than 1000 V ( *second revision* ).

†Specification for porcelain post-insulators for systems with a nominal voltages greater than 1000 V ( *first revision* ).

‡Specification for bushings for alternating voltages above 1000 V ( *first revision* ).

§Specification for radio interference measuring apparatus for the frequency range 0.15 MHz to 1000 MHz.



- $F$  — Filter having a high impedance at the measuring frequency.
- $M$  — Measuring equipment.
- $R_L$  — Equivalent resistance of  $R_1$  in series with the parallel combination of  $R_2$  and the resistance of the measuring set.
- $Z_s$  — May be either a capacitor or a circuit composed of a capacitor and an inductor in series. When  $R_L$  is of the order of  $300\Omega$  the impedance of  $Z_s$  and  $R_L$  in series at the measuring frequency shall be  $300 \pm 40\Omega$  and have a phase angle not exceeding  $20^\circ$ .
- $L$  — Has a low impedance at 50 Hz to shunt power-frequency current from the measuring set, but has a high impedance, for example greater than  $3\,000\Omega$ , at the measuring frequency.

FIG. 1 DETAILS OF THE TEST CIRCUIT FOR RADIO INTERFERENCE TEST ON INSULATORS

5.4 The filter  $F$  shall have a high impedance at the measuring frequency so that the impedance between the high-voltage conductor and earth,  $Z_s + R_L$  is not appreciably shunted as seen from the insulator under test. This filter also reduces circulating radio frequency currents in the test circuit generated by the high-voltage transformer or picked up from extraneous sources. A suitable value for its impedance has been found to be 10 000 ohms to 20 000 ohms at the measuring frequency.

**5.5** When the test insulator is removed or replaced by an element known to be free from radio interference, the radio interference level indicated by the measuring set ( the background level ) at the specified test voltage shall be as low as possible and preferably 10 dB below the specified radio interference level of the insulator to be tested. In a determination of the radio interference characteristics of an insulator, the background level shall be at least 6 dB below the lowest level which is to be measured.

**5.6** As the radio interference level may be affected by fibres or dust settling on the insulator, it is permitted to wipe the insulator with a clean cloth before taking a measurement. The atmospheric conditions during the test shall be recorded. It is not known what correction factors apply to radio interference testing, but it is known that tests may be sensitive to high relative humidity and the results of tests may be open to doubt if the relative humidity exceeds 80 percent.

**5.7** The test procedure shall be in accordance with **5.7.1** and **5.7.2**.

**5.7.1** A voltage 10 percent higher than the specified test voltage shall be applied to the object under test and maintained for at least 5 minutes. The voltage shall then be decreased by steps down to 30 percent of the specified test voltage, raised again by steps to the initial value and finally decreased by steps to the 30 percent value. At each step, a radio interference measurement shall be taken and the radio interference levels as recorded during the third run shall be plotted versus the applied voltage; the curve so obtained is the radio interference characteristic of the insulator.

NOTE — Each voltage step shall be approximately 10 percent of the specified test voltage.

**5.7.2** The string insulator set, string insulator-unit, post insulator, bushing or rigid insulator passes the radio interference test if the radio interference level at the specified test voltage, as read from the radio interference characteristic, does not exceed the specified radio interference level. Furthermore, no sudden increase shall be found on the radio interference characteristic between the specified test voltage and 1.1 times the specified test voltage.

NOTE 1 — In the absense of a specified test voltage, the radio interference characteristic of an insulator may be determined by measurements as described above over a suitable range of applied voltages. To cover any likely values of specified test voltage, it is suggested that the radio interference characteristic is measured for the voltage range 3 percent to 30 percent of the dry power-frequency flashover voltage of the insulator.

NOTE 2 — Because of the high variability, it is preferable to make radio interference measurements on a number of insulators. The radio interference characteristic is the mean curve obtained taking into account all measurements made on insulators of one type.

NOTE 3 — IS:6872-1972\* gives information regarding the other suitable circuits which may be employed for measurement of radio interference.

\*Specification for radio interference measuring apparatus.